United States
Department of
Agriculture

Economic
Research
Service

Agricultural
Economic
Report
Number 550

Idling Erodible Cropland: Impacts on Production, Prices, and Government Costs

Shwu-Eng H. Webb, Clayton W. Ogg,
and Wen-Yuan Huang

Additional copies of this report...

can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Ask for Idling Erodible Cropland: Impacts on Production, Prices, and Government Costs (AER-550). Write to the above address for price and ordering instructions. For faster service, call the GPO order desk at (202) 783-3238 and charge your purchase to your VISA, MasterCard, Choice, or GPO Deposit Account. A 25-percent bulk discount is available on orders of 100 or more copies shipped to a single address. Please add 25 percent extra for postage for shipments to foreign addresses.

Microfiche copies ($5.95 each) can be purchased from the Order Desk, National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. Ask for Idling Erodible Cropland: Impacts on Production, Prices, and Government Costs (AER-550). Enclose check or money order payable to NTIS; add $3.00 for handling each order. For faster service, call NTIS at (703) 487-4650 and charge your purchase to your VISA, MasterCard, American Express, or NTIS Deposit Account. NTIS will ship rush orders within 24 hours for an extra $10; call 800-336-4700.

The Economic Research Service has no copies for free distribution.

Idling Erodible Cropland: Impacts on Production, Prices, and Government Costs. By Shwu-Eng H. Webb, Clayton W. Ogg, and Wen-Yuan Huang. Natural Resource Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 550.

ABSTRACT

A Government program to put erodible land into a conservation reserve would reduce soil erosion and complement the goals of commodity programs by supporting crop prices and reducing Government deficiency and storage payments. To identify erodible and fragile land, this study developed land group criteria that link productivity with potential soil erodibility. About 32 million acres of U.S. cropland were identified as highly erodible and fragile. The study then estimated the impact of idling those acres on production and prices for seven major crops (corn, soybeans, wheat, sorghum, oats, barley, and cotton) under assumptions generally consistent with recent farm legislation.

Keywords: erodible, land group, conservation reserve, linear programming, erosion, deficiency, surplus, cropland

ACKNOWLEDGMENTS

We thank Tony Grano, Ralph Heimlich, and Jim Langley of ERS, David Ervin of the University of Missouri, Dana Hoag of North Carolina State University for their review of the draft and valuable suggestions for revising the draft. Michael Price also of ERS provided assistance in estimating the price impacts in the study. We thank Nancy Furr for typing drafts.

Washington, D.C. 20005-4788

April 1986

CONTENTS

SUMMARY

Eleven percent of the land producing seven major crops accounts for 43 percent of total soil erosion from cropland (excluding wind erosion). Many of the crops grown on that land are in surplus, for which the Government pays deficiency and storage payments to keep the prices up and to keep some of the surplus off the market. If that erodible land were set aside and put into a conservation reserve, those Government outlays could be reduced, the land could be protected, and other off-farm effects of excessive soil erosion would be reduced.

This study classifies land into categories that describe its erosion and productive potential. With both of those factors known, the costs and benefits involved in idling the highly erodible land can be estimated. The seven major crops considered use 75 percent of all U.S. cropland. The highly erodible acreage is distributed among those seven crops as follows: corn, 13 million acres; soybeans, 7 million acres; wheat, 7 million acres; sorghum, 1.5 million acres; oats, 1.4 million acres; barley, 600,000 acres; and cotton, 600,000 acres.

Protecting 32 million acres of highly erodible land would reduce soil losses from erosion by nearly 600 million tons per year. Putting highly erodible land into a reserve will reduce its erosion rate to about one-tenth its current level, which averages 20 tons per acre per year.

Prices of soybeans, corn, sorghum, oats, and barley would increase over what they would have been in absence of conservation programs. If all the erodible land were put into a conservation reserve, the Government would save over $5 billion annually in deficiency and storage payments. Retiring erodible land would not take care of all crop surpluses. About 7 million acres planted to wheat, for example, are highly erodible, but about 21 million acres would have to be set aside to avoid a buildup of wheat stocks.

USDA ANNOUNCES NEW CONSERVATION RESERVE PROGRAM

On January 13, 1986, Secretary of Agriculture John R. Block said farmers may begin in early March to volunteer highly erodible cropland for entry into the Conservation Reserve Program, a provision of the Food Security Act of 1985.

Highly erodible land that enters the Conservation Reserve Program will be ineligible for farming for 10 years and must instead be planted with permanent vegetative cover.

Up to 45 million acres may be enrolled in the reserve between 1986 and 1990. The yearly program acreage goals are at least 5 million for the 1986 crop year, 10 million or more each year 1987 through 1989, and 5 million or more for 1990.

Program participants will receive rental payments, the amounts depending on the bids per acre and the number of acres under the 10-year contracts. Participants also will receive 50 percent of eligible costs of establishing trees or grass on the acreage placed in the reserve.

Rental payments will compensate farmers for retiring highly erodible cropland from crop production. The conservation payments will partly reimburse farmers for half the one-time costs of establishing vegetative cover.

Rental payments will be made annually as soon as practicable after October 1 of each calendar year. Cost-sharing payments will be made as soon as possible after individual participants report their conservation treatments are in place.

The total amount of rental payments for any fiscal year may not exceed $50,000 or its equivalent, if in-kind payments are made. There is no payment limit on cost-sharing for cover establishment.

"Farmers who decide to return land to production during the 10-year contract must repay the government, with interest, all of its costs for annual rental and for establishing cover," said Block. "In the event of national need, however, the Secretary of Agriculture may declare that any farmer who wants to return the land to production may do so without penalty."

USDA agencies will administer the program. Technicians from USDA's Soil Conservation Service will help farmers determine if their land is eligible; the Extension Service will lead public information and education efforts; and the Forest Service will coordinate and provide technical assistance for tree planting.

State and local agencies also will lend assistance. State forestry agencies will help prepare and approve tree planting plans. State wildlife agency representatives will serve on the conservation review groups to recommend and assist in determining the cover practice specifications necessary for wildlife enhancement. State conservation agencies will recommend and assist with erosion control requirements. Local conservation districts will approve all plans.

Idling Erodible Cropland: Impacts on Production, Prices, and Government Costs

Shwu-Eng H. Webb, Clayton W. Ogg,
and Wen-Yuan Huang

INTRODUCTION

Various Federal conservation and commodity programs are used to achieve the somewhat overlapping goals of protecting the land from erosion and supporting crop prices when supplies are too plentiful. Some conservation objectives can be achieved through commodity programs and some commodity supply objectives can be achieved through conservation programs. In this report, we show how a program to retire highly erodible land from crop production can reduce soil erosion, help support crop prices, and reduce Government deficiency and storage payments.

If such a program could be implemented soon, its timing would be felicitous. Many crops grown on erodible land are currently in surplus. The demand, both foreign and domestic, for these commodities is likely to remain low for several years, contributing to pressure to reduce acreage and production to bolster prices. Retiring all the highly erodible and fragile land from production would be a cost-effective means to complement the goals of commodity programs in times of excess supply (5, 8).1/ A long-term acreage reduction program, if targeted to erodible land, could greatly reduce soil loss and related water pollution problems.

To identify the amount of erodible land now in production, we developed land group criteria that related soil erodibility and productivity. By estimating the distribution of the acreage of each land group, we are able to estimate the potential impacts on soil loss, crop production (for seven major field crops), farm income, and Government payments through 1990, if such land were removed from production.

DEFINITIONS OF ERODIBLE LAND

There are several definitions of erodible land. We will describe three: the system used in the past, criteria proposed recently, and those developed in this study.

1/ Underscored numbers in parentheses cite References at the end of the report.

Soil Groupings Used in the Past

The Soil Conservation Service (SCS) land capability class (LCC) and subclass system is widely used to identify land types with limitations for agricultural use. The class number ranges from I (land with few limitations) to VIII (land that should be restricted to recreation, wildlife habitat, water supply, or other esthetic purposes). Within each of these soil classes (except I and V), subclasses identify the dominant limitations to agricultural use. These include erosion hazards (e), wetness (w), stony or root-zone limitations (s), and climatic limitations (c). The most fragile land in the LCC system is in classes V, VI, VII, and VIII. This land is considered largely unsuitable for crop uses.

The LCC system placed soils suffering from both potentially high erosion and low yields in LCC IVe, VIe, VIIe, and VIIIe. This definition of erodible land ignored potentially very erodible but productive soils in classes IIe and IIIe. Since past commodity programs had no incentive for adequately treating highly erodible land, it made sense to identify just the erodible and unproductive soils. However, our study of current cost-shared acreage reduction options must consider alternatives for idling highly erodible soils that are also productive, and most of these soils are in LCC IIe and IIIe rather than IVe to VIIIe.

Another limitation of the LCC system for the acreage reduction analysis is that subclass e identifies only soils for which erosion is the dominant limitation. Soils in other subclasses, however, may also have substantial erosion problems. About 39 million acres of cultivated cropland in classes II, III, and IV are eroding at more than 15 tons per acre per year (table 1).2/ About a

2/ All the data in this study are based on the 1982 National Resource Inventory (NRI) except information contained in tables 1 and 2. Tables 1 and 2 are based on backup data in a previous study (3) which used data from the 1977 NRI.

Table 1--Acres of cultivated cropland in land capability classes II, III, IV and the corresponding subclass by erosion rate

LCC	Less than 15 TAY 1/	More than 15 TAY 1/	Total
		1,000 acres	
II	140,356	10,312	150,668
III	74,499	18,831	93,330
IV	17,213	9,565	26,788
Total	232,068	38,708	270,776
Subclass e:			
IIe	83,420	5,368	88,788
IIIe	65,249	14,454	79,703
IVe	22,713	6,608	29,321
Total	171,382	26,430	197,812

1/ Wind, sheet, and rill erosion.
Source: (12).

third of these 39 million acres are not in subclass e, and a large portion of subclass e does not erode at more than 15 tons per acre per year (TAY). [If a field is eroding at more than 15 TAY, it is generally difficult to treat adequately with conservation practices as long as the land remains in crop production (7).]

There are many ways to define "erodible" land. Table 2 shows the erodible cropland groupings, erosion rates, and total erosion under different criteria. For sheet and rill erosion, using subclass e as a criterion, the total acreage in classes IIIe, IVe, VIe, and VIIe is about four times more than the acreage eroding at greater than 15 TAY (table 2). The amount of erosion in classes IIIe, IVe, VIe, and VIIe is, however, only about 95 percent of total erosion from land eroding at more than 15 TAY. The total amount of acres in classes IVe, VIe, and VIIe is about 1.4 times more than the total acres of land with a sheet and rill erosion rate greater than 15 TAY. Yet the erosion tonnage from classes IVe, VIe, and VIIe is only 40 percent of the erosion from land with 15 TAY or more. For soil conservation purposes, many subclass e soils are not highly erodible, so it would be very difficult to target the limited financial assistance for conservation to the most needy areas by using only subclass e.

New Classification by Bills and Heimlich

The 1977 NRI used the Universal Soil Loss Equation (A=R*K*(L*S)*C*P) to estimate annual sheet and rill erosion for the entire Nation. The average annual erosion rate in tons per acre (A) in a given area is the product of its rainfall erosion index (R), soil erosion index (K), slope length (L), slope steepness (S), cropping practices (C), and conservation practices (P). The RKLS factors represent the physical features of cropland which are less amenable to manipulation by conservation programs. 3/ The product of the C and P factors reflects the kind of management applied to the land. The product of CP has a theoretical range from 0 to 1. However, the maximum CP recorded in the 1977 NRI was 0.7 and less than 5 percent of inventoried cropland had combined CP of more than 0.5 (4). The average CP value for cropland in 1977 was 0.3.

3/ In some cases, land management affects the physical constraints on soil loss. For example, the principal effect of terraces and diversions on soil loss is through changes in slope length (1).

Table 2--Total acres and erosion of U.S. cropland under alternative erosive land criteria 1/

Item	Unit	More than 15 TAY	Land classes IIIe, IVe, VIe, and VIIe	Land classes IVe, VIe, and VIIe
Acres	Million	28	119	40
Erosion	Million tons	1,022	981	429
Erosion	Tons/acre	36	8	11

1/ Includes sheet and rill erosion only.
Source: (12).

Bills and Heimlich of ERS partitioned the factors that determine erosion rates into physical (RKLS) and managerial (CP) components (1). They combined the technique of separating physical erosion potential from managerial factors with the idea of a tolerable soil loss, and developed a taxonomy (table 3) to classify cropland according to its contribution to the Nation's soil erosion problem. Under this taxonomy, the highly erosive land is defined as RKLS > 50. Even the most effective conservation tillage and cropping practices cannot reduce these soils' erosion rate to 5 TAY if the land is used to grow crops. Each soil has a particular soil loss tolerance, indicating that regeneration occurs at different rates. In general, it is assumed that 5 TAY is an acceptable erosion rate.

New Land Group Criteria

To examine alternative acreage reduction programs, we combined the RKLS erosion factors in the Universal Soil Loss equation with the LCC system (table 4). Highly erodible land is defined as the cropland in classes IIe, IIIe, and IVe with RKLS greater than 50 (land groups 4 and 5 in table 4), as in Bills and Heimlich. Such highly erodible cropland, if removed from intensive crop production and put in permanent cover, would have about one-tenth of its erosion rate as when in crop uses. Fragile land (land group 6 in table 4) is then defined as land in LCC VI, VII, and VIII, which SCS has designated as unsuitable for crop production.

The remaining land groups were also defined to consider productivity as well as erodibility. Briefly, the six land groups include: land group 1--with the highest yields among these six land groups and low erosion potential; land group 2--with low yield and low erosion potential; land group 3--with high yields and medium erosion potential; land groups 4 and 5--with medium yields and a high erosion potential; and land group 6--with the lowest crop yield and medium to high erosion potential.

There are three main characteristics of our land group criteria:

- o First, they relate erodibility to productivity (table 5). The yields on land group 1 for all crops are the highest while the erosion rate

Table 3--A taxonomy of cropland erosivity

Erosion class	Definition
Nonerosive	RKLS < 7
Moderately erosive:	
Managed below tolerance	RKLS > 7; USLE < 5
Managed above tolerance	RKLS < 50; USLE > 5
Highly erosive	RKLS > 50; USLE > 5

Source: (1).

Table 4--Land group, land capability class, erosion potential, and crop yield

Land group	Land capability class and subclass 1/	Erosion potential	Crop yield
1	I, IIwa, IIIwa	Low	Highest
2	IIw, IIs, IIc, IIIs, IIIc, IVw, IVs, IVc	Low	Low
3	IIe, IIIe, and IVe with RKLS < 50	Medium	High
4	IIe, IIIe with RKLS > 50	High	Medium
5	IVe with RKLS > 50	High	Medium-Low
6	VI, VII, and VIII	High or Low	Lowest

1/ Subclass denotes dominant limitation; c = climate; e = erosion; s = shallow, droughty, or stony soil; w = wetness; wa = wetness, but adequately treated.

is the lowest among all land groups. Land group 2 has a low erosion rate; it also has very low yields. Along with land group 6, they are the least productive soils. Among land groups 3, 4, and 5, productivity generally declines as the land group number increases. 4/

- Second, like the Bills and Heimlich soil taxonomy, these criteria separate the physical factors of soil erosion from managerial factors. Thus, one can identify soils that are potential candidates for a long-term conservation reserve and those for conservation investment. Land groups 4 and 5 in our study are the soils with such high RKLS values that one cannot economically adopt conservation practices to obtain acceptable erosion rates as long as the land is used to grow crops. Therefore, land groups 4 and 5 would be ideal for a conservation reserve if a commodity is in surplus. Soils in land group 3 are productive, but with medium erosion potential so that proper management practices can result in an acceptable erosion rate while used for intensive crops. Financial and technical assistance for conservation on these soils would yield the highest return on conservation investment. This type of land would be an ideal candidate for targeting conservation assistance.

- Third, the criteria identify a small area made up of soils (land group 6) unsuitable for crop production due to low yields as well as erosion. If commodity supplies are in surplus, these lands should be withdrawn from growing commercial crops other than hay, perhaps permanently.

4/ An exception is the productivity of sorghum, wheat, and barley for land groups 3 and 4. Location is the main reason; since more of land group 4 is located in productive regions, it sometimes has higher yields than land group 3.

Table 5--Acres, erosion rate, and yield for crops by land group

Crop	Unit	Land group 1	Land group 2	Land group 3	Land group 4	Land group 5	Land group 6	Total
Corn:								
Acres	1,000	24,422	23,152	29,890	7,922	2,943	2,430	90,759
Erosion rate	Tons/acre	2.36	3.00	5.54	21.12	29.13	21.91	6.60
Yield	Bu/acre	109.4	67.3	96.0	84.6	79.1	36.6	89.2
Soybeans:								
Acres	1,000	19,143	23,489	16,716	4,582	1,367	1,286	66,583
Erosion rate	Tons/acre	2.77	3.96	7.28	26.13	35.88	29.62	7.13
Yield	Bu/acre	32.7	25.0	31.1	29.7	24.5	13.3	28.8
Wheat: 1/								
Acres	1,000	9,111	22,734	49,250	2,114	1,186	3,918	88,313
Erosion rate	Tons/acre	1.61	1.66	2.82	17.60	19.97	7.80	3.20
Yield	Bu/acre	44.3	28.6	30.5	32.5	28.1	17.3	30.9
Sorghum:								
Acres	1,000	2,590	4,919	8,275	504	300	676	17,263
Erosion rate	Tons/acre	2.17	2.50	4.16	19.70	21.18	10.58	4.39
Yield	Bu/acre	86.8	43.6	55.0	33.7	43.8	22.4	54.4
Cotton:								
Acres	1,000	2,395	5,793	7,761	136	35	383	16,502
Erosion rate	Tons/acre	2.57	3.03	3.85	31.39	42.38	5.43	3.72
Yield	Bale/acre	1.80	.96	.90	.44	.43	.28	1.04
Oats:								
Acres	1,000	1,199	2,241	4,246	655	344	436	9,121
Erosion rate	Tons/acre	1.52	1.58	3.34	12.60	17.73	10.29	4.21
Yield	Bu/acre	71.5	49.4	74.2	62.6	50.5	40.0	63.4
Barley: 1/								
Acres	1,000	653	2,393	4,280	150	135	424	8,035
Erosion rate	Tons/acre	.93	1.07	2.86	15.99	18.11	5.02	2.78
Yield	Bu/acre	62.9	48.9	51.0	52.5	51.1	35.1	50.5

1/ The slight reversals of productivity for wheat and barley for land groups 3 and 4 are due to the location (i.e., more land in land group 4 located in the more productive regions).

Source: Acres and erosion rates are from the 1982 NRI; yields are estimates from the ERS model described in (5).

DISTRIBUTION OF HIGHLY ERODIBLE AND FRAGILE LAND

Erosion rates and distribution of highly erodible and fragile land by crop are evaluated first in this section. Next, the regional distribution of highly erodible and fragile acres for each of the seven major crops is discussed. Because of data limitation, potential wind erosion is not considered in this study.

U.S. Cropland Erosion

According to the 1982 National Resource Inventory (NRI), sheet and rill erosion caused about 1.8 billion tons of soil erosion per year on 421 million acres of U.S. cropland for an average erosion rate of 4.4 tons per acre per year. Seven major crops--corn, wheat, soybeans, sorghum, cotton, barley, and oats--accounted for about 70 percent (297 million acres) of the total U.S. cropland inventoried in 1982. Since summer fallow and hay have a close relationship with these crops, they are included in the analysis where relevant. With the inclusion of summer fallow and hay, the acreage covered in this study reaches 375 million acres, about 90 percent of total U.S. cropland inventoried in 1982.

Most U.S. cropland is in land group 3 (42 percent), followed by land group 2 (27 percent), and land group 1 (18 percent; see table 6). About 13 percent of major cropland is either highly erodible or fragile (land groups 4, 5, and 6). This land accounts for about 43 percent of the soil erosion from U.S. cropland.

The average erosion rate for row crops is 6.3 TAY and for close-grown crops 3.3 TAY. Row crops are more erosion-prone than close-grown crops for two reasons: (1) row crops are grown on a higher percentage of highly erodible and fragile land, 23 percent versus 9 percent for close-grown crops, and (2) row crops leave more land surface exposed to wind and water. Cotton and sorghum crops experience the most wind erosion for they are concentrated in windy areas of the Great Plains and Mountain regions.

Table 6--Distribution of cropland acres and erosion by land group

Land group	Total acres 1/		Total erosion		Average erosion rate
	Million acres	Percent of U.S.	Million tons	Percent of U.S.	Tons per acre
1	67.7	18.1	143.0	8.4	2.11
2	102.4	27.3	250.9	14.8	2.45
3	157.9	42.1	579.5	34.2	3.67
4	21.3	5.7	370.4	21.9	17.39
5	9.3	2.5	192.5	11.4	20.70
6	16.2	4.3	158.4	9.3	9.80
Total	374.8	100.0	1,694.7	100.0	4.52

1/ Total acres include acreage for corn, soybean, wheat, cotton, sorghum, barley, oats, summer fallow, and hay.

Source: (11).

Among the seven major crops considered here, soybeans have the highest average U.S. sheet and rill erosion rate, 7.1 TAY, and corn is next with 6.6 TAY (table 7).

Barley and wheat are the two least erosive crops, eroding at 2.8 and 3.2 TAY, respectively. The average erosion rates for summer fallow and hay are relatively low as well (2.8 and 1.3 TAY respectively). But about 2 million acres of summer fallow are on highly erodible and fragile land with an average erosion rate of 9 TAY. The average erosion rate for the seven major crops combined is 5.2 TAY. For the 375 million acres of major cropland, the average erosion rate is 4.5 TAY.

About 47 million acres of the 375 million acres of major cropland, including summer fallow and hay, are highly erodible and fragile land (table 8). On highly erodible acres, soybeans and corn have the highest erosion rate, with 29 TAY for soybeans and 23 TAY for corn. Although 13 million acres of hayland are potentially highly erodible and fragile, their erosion rate is only 3.2 TAY. Soil erosion is not a problem as long as the land remains in hay production.

Table 7--Acres, erosion rate, and amount of erosion by crop

Crop	Acreage	Average erosion rate	Total soil loss
	Mil. acres	Tons/acres	Mil. tons
Row crops:			
Corn	90.8	6.6	599.0
Soybean	66.6	7.1	474.6
Sorghum	17.3	4.4	75.9
Cotton	16.5	3.7	61.4
Total	191.2	6.3	1,210.9
Small grains (closely grown crops):			
Wheat	88.3	3.2	283.0
Oats	9.1	4.2	38.4
Barley	8.0	2.8	22.3
Total	105.4	3.3	343.7
7 major crops	296.6	5.2	1,554.6
Summer fallow	27.5	2.8	75.6
Hay	50.8	1.3	64.6
Total	374.9	4.5	1,694.6

Source: (11).

Table 8--Acres and erosion for highly erodible and fragile land

Crops	Area	Proportion of cropland	Soil loss	Erosion rate	Percent of total erosion from erodible acres
	Mil. acres	Percent	Mil. tons	Tons/acre	Percent
Row crops:					
Corn	13.3	14.6	306.1	23.0	51.1
Soybean	7.2	10.8	206.9	28.6	43.6
Sorghum	1.5	8.7	23.5	15.9	31.0
Cotton	.6	3.6	7.8	14.1	13.0
Total	22.6	11.8	544.3	24.1	45.0
Small grains:					
Wheat	7.2	8.2	91.5	12.7	32.3
Oats	1.4	15.4	18.9	10.3	38.5
Barley	.7	8.8	6.8	9.6	30.5
Total	9.3	8.9	117.2	12.0	32.9
7 major crops	31.9	10.8	661.5	20.6	42.6
Summer fallow	2.1	7.6	18.4	8.8	24.3
Hay	12.8	25.2	41.1	3.2	63.6
Total	46.8	12.5	721.0	15.3	41.1

Source: (11).

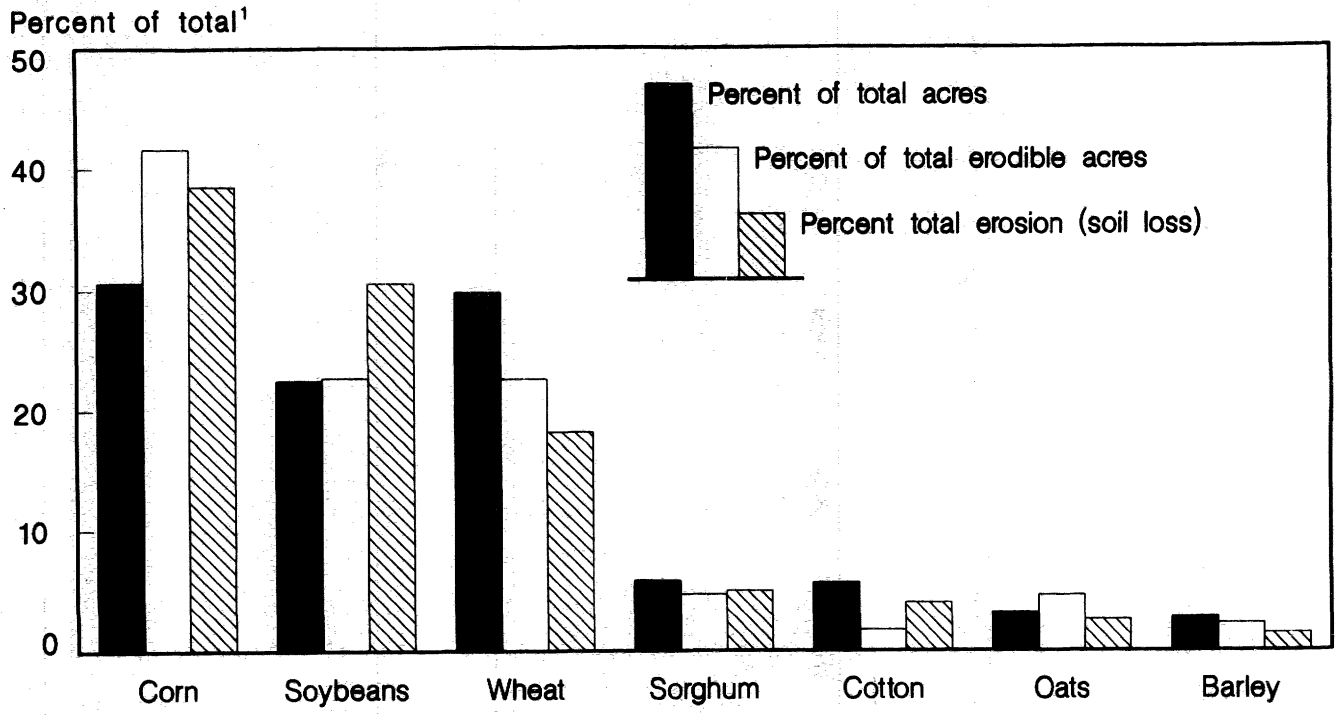
In terms of acreage, corn and wheat are the most important crops. About 31 percent of U.S. major cropland was used to grow corn and another 30 percent to grow wheat in 1982 (fig. 1). Corn, however, is a much more erosive crop than wheat; corn occupies about 42 percent of highly erodible land and contributes 39 percent of erosion from the seven major crops. Wheat accounts for only 23 percent of highly erodible land and 18 percent of erosion in major crop production. Soybeans account for 23 percent of cropland acres and of the Nation's highly erodible acres, and contribute 31 percent of the Nation's erosion from the seven major crops. Sorghum and cotton each account for about 6 percent of major cropland. Sorghum claims about 5 percent of both highly erodible acres and erosion. Cotton is grown on 2 percent of highly erodible land and contributes 4 percent of erosion. Oats and barley each account for about 3 percent of cropland. Oats have 5 percent of erodible land and contribute 3 percent of erosion. Barley is a less erosive crop; it has only 2 percent in highly erodible land, and contributes only a little above 1 percent of the Nation's erosion from the seven major crops.

Regional Distribution of Erodible and Fragile Land for Seven Major Crops

The Corn Belt is the biggest producing region of the seven crops, accounting for about 28 percent of acres planted to these crops. The Corn Belt is also

Figure 1

Distribution of total acres, highly erodible acres, and erosion, by crops



1/ For seven major crops -- corn, soybeans, wheat, sorghum, cotton, oats, and barley.

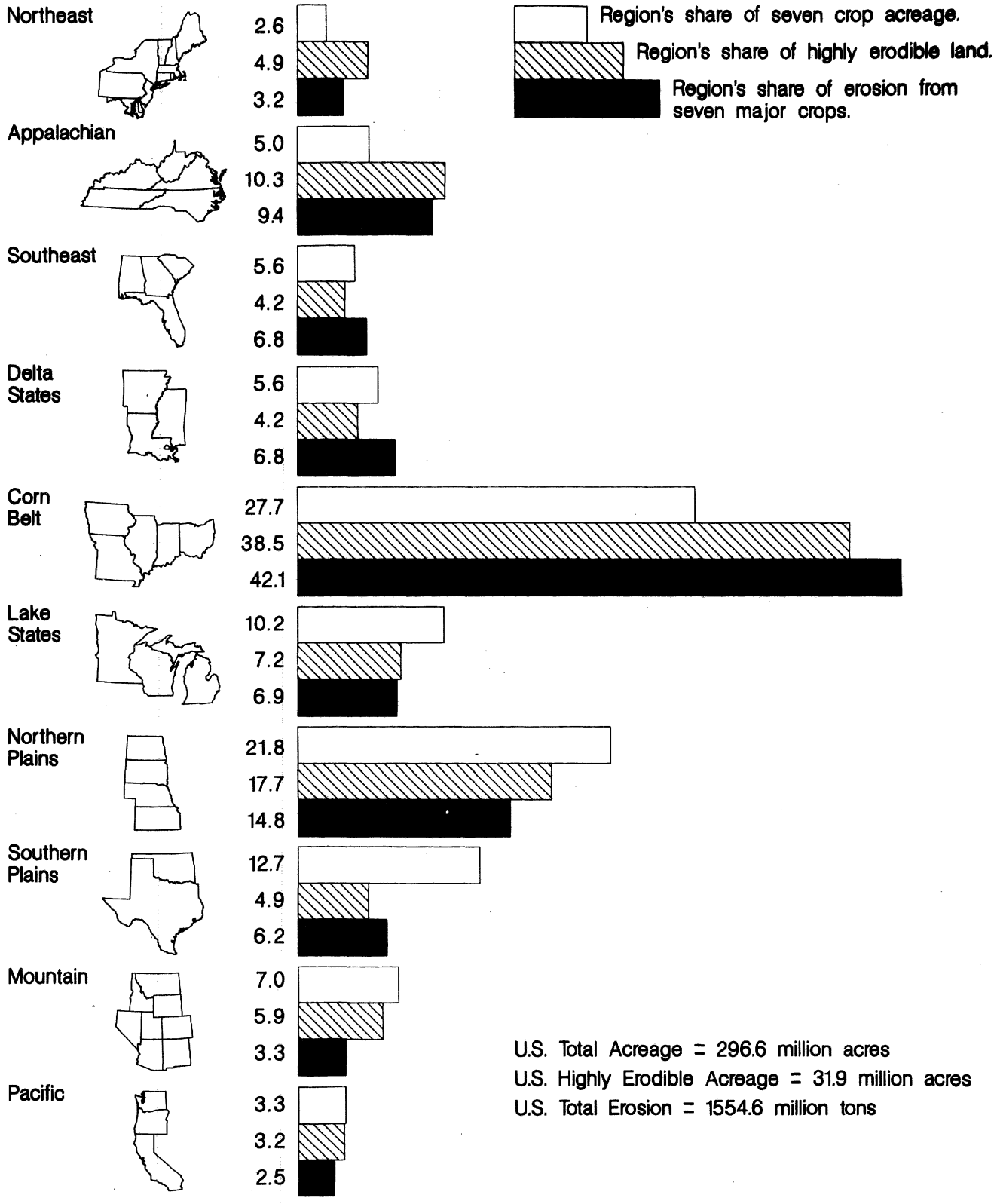
the most erosive region. It has about 39 percent of the Nation's highly erodible land and contributes 42 percent of erosion from the production of these crops (fig. 2). The other major crop-producing region--Northern Plains--has a lower proportion of cropland that is highly erodible. The Northern Plains accounts for 22 percent of major U.S. cropland, 18 percent of the Nation's highly erodible land, and 15 percent of erosion from growing these crops. The Southern Plains, Lake States, and Mountain regions are next in importance of growing crops, accounting for 13, 10, and 7 percent of cropland, respectively. They are also less erosive. The Southern Plains has 5 percent of the Nation's erodible land and contributes 6 percent of major cropland erosion. The Lake States' share of highly erodible land is 7 percent and it contributes 7 percent of erosion from cropland. The Mountain region has 6 percent of the Nation's highly erodible cropland and contributes 3 percent of the Nation's erosion from major cropland. The Pacific region accounts for 3 percent of the Nation's cropland, highly erodible land, and erosion. The Delta States, Appalachian, Southeast, and Northeast are relatively erosive areas with their share of erosion greater than their share of cropland.

Table 9 summarizes the distribution of the acreage of highly erodible and fragile land by crop for each region. Table 10 shows the distribution of the soil loss from highly erodible and fragile land by region. Tables that show the distribution of highly erodible and fragile land, by crop and region are presented in the appendix.

Corn covers approximately 91 million acres according to the 1982 NRI, of which about 13.3 million acres (15 percent) are highly erodible and fragile land--10.9 million acres are highly erodible (land groups 4 and 5) and 2.4 million

Figure 2

Regional distribution of cropland acreage, highly erodible, and erosion for seven major crops, 1982[1]



1/ Seven crops are: corn, soybeans, wheat, sorghum, cotton, oats, and barley.

Table 9--Highly erodible and fragile land, by region and crop

Region	Corn	Soybeans	Wheat	Sorghum	Cotton	Oats	Barley	Total
				1,000 acres 1/				
Northeast	1,232 (23)	66 (7)	132 (20)	0 (0)	0 (0)	111 (20)	15 (13)	1,556 (20)
Appalachian	1,305 (23)	1,337 (20)	489 (26)	44 (20)	72 (20)	19 (30)	25 (23)	3,291 (22)
Southeast	260 (8)	566 (9)	133 (10)	53 (16)	40 (5)	8 (10)	4 (25)	1,066 (9)
Delta States	82 (28)	996 (8)	95 (9)	56 (12)	90 (3)	8 (20)	0 (0)	1,326 (8)
Corn Belt	6,644 (16)	3,480 (12)	1,450 (18)	215 (18)	0 (0)	479 (45)	8 (41)	12,277 (15)
Lake States	1,768 (11)	161 (3)	88 (2)	4 (5)	0 (0)	273 (12)	10 (1)	2,302 (8)
Northern Plains	1,911 (13)	615 (15)	1,919 (6)	742 (10)	0 (0)	364 (11)	89 (4)	5,640 (9)
Southern Plains	15 (1)	14 (2)	822 (5)	231 (4)	340 (3)	124 (10)	16 (12)	1,562 (4)
Mountain	69 (4)	0 (0)	1,400 (10)	135 (13)	8 (1)	24 (8)	263 (9)	1,899 (9)
Pacific	9 (1)	0 (0)	690 (13)	0 (0)	4 (0)	25 (11)	279 (16)	1,007 (10)
Total	13,294 (15)	7,235 (11)	7,218 (8)	1,480 (9)	554 (3)	1,435 (16)	709 (9)	31,926 (11)

1/ Numbers in parentheses show the percentage of highly erodible and fragile land in cropland acreage for each crop.

Table 10--Soil loss from highly erodible and fragile land, by region and crop

Region	Corn	Soybeans	Wheat	Sorghum	Cotton	Oats	Barley	Total
				Million tons 1/				
Northeast	20.8 (56)	1.6 (32)	1.9 (54)	<.1 (37)	0 (0)	1.9 (58)	0.1 (20)	26.3 (53)
Appalachian	32.9 (63)	42.3 (60)	9.4 (62)	1.0 (50)	2.5 (53)	.3 (75)	.3 (50)	88.8 (61)
Southeast	4.6 (26)	11.5 (28)	2.0 (14)	1.0 (39)	1.0 (16)	.1 (25)	.1 (56)	20.3 (27)
Delta States	1.8 (62)	21.7 (29)	1.7 (24)	1.5 (46)	2.1 (12)	.1 (33)	0 (0)	28.9 (27)
Corn Belt	178.8 (53)	111.1 (48)	34.4 (56)	5.8 (53)	0 (0)	7.5 (78)	.1 (40)	337.7 (52)
Lake States	27.5 (38)	3.6 (18)	1.0 (14)	<.1 (17)	0 (0)	2.1 (36)	<.1 (5)	34.2 (32)
Northern Plains	39.3 (55)	15.1 (49)	16.1 (20)	12.1 (37)	0 (0)	5.3 (41)	.2 (7)	79.9 (35)
Southern Plains	.2 (6)	.1 (5)	3.8 (11)	1.7 (8)	2.2 (7)	1.0 (26)	<.1 (6)	9.0 (9)
Mountain	.2 (7)	0 (0)	9.5 (26)	.4 (15)	<.1 (1)	<.1 (11)	2.0 (25)	12.1 (23)
Pacific	<.1 (3)	0 (0)	11.7 (41)	0 (0)	<.1 (1)	.4 (50)	4.0 (50)	16.1 (42)
Total	306.1 (51)	207.0 (44)	91.5 (32)	23.5 (31)	7.8 (13)	18.8 (50)	6.8 (31)	653.3 (43)

1/ Numbers in parentheses show the ratio of soil loss from highly erodible and fragile land to the total soil loss for each crop in each region.

acres are fragile (app. table 1). This 15 percent of corn land accounts for 51 percent of the soil loss from corn cropland. Most of this land (10.3 million acres) is in the Corn Belt, Lake States, and Northern Plains. However, the proportion of erodible and fragile corn land in the Northeast and Appalachian States (23 percent) is greater than the national average.

Soybeans cover 67 million acres, with about 11 percent on highly erodible and fragile land; 5.9 million acres are highly erodible, and 1.3 million acres are fragile (app. table 2). About 44 percent of soybean erosion comes from this 11 percent of soybean acreage. The Corn Belt and Appalachian States have about 4.8 million acres of soybeans that are highly erodible and fragile. Their proportion of erodible and fragile land exceeds the national average in both regions.

Wheat covers about 88 million acres with about 8 percent on highly erodible and fragile land (app. table 3). Wheat has the highest amount of fragile land planted (3.9 million acres), among the seven major crops. Highly erodible wheat land amounts to 3.3 million acres. Approximately 32 percent of wheat erosion comes from the 8 percent of wheat land that is highly erodible and fragile. The Corn Belt, Northern Plains, and Mountain regions account for 4.8 million acres of highly erodible and fragile land. The Appalachian, Northeast, and Corn Belt regions have a much higher proportion of wheat land that is highly erodible and fragile with 26, 20, and 18 percent, respectively.

Sorghum covers 17.3 million acres, with about 9 percent on highly erodible and fragile land--805,000 acres are highly erodible and 676,000 acres are fragile land (app. table 4). This 9 percent of acreage accounts for 31 percent of soil erosion from sorghum acreage. Half of this highly erodible and fragile land is in the Northern Plains, with most of the remainder in the Southern Plains, Corn Belt, and Mountain regions.

Cotton has the smallest percentage (3 percent) of highly erodible and fragile land (sheet and rill erosion only) among the seven major crops (app. table 5). About 13 percent of erosion from cotton comes from this 3 percent of the land. Cotton is grown on about 383,000 acres of fragile land and 170,000 acres of highly erodible land. Most of the highly erodible and fragile land is in the Southern Plains with the rest in the Delta, Appalachian, and Southeast regions.

Oats have the highest percentage (15.7 percent) of highly erodible and fragile land among the seven major crops (app. table 6). About 1.4 million acres of the 9 million acres in oats are in the highly erodible and fragile category. About 1 million acres of highly erodible land and 436,000 acres of fragile land are used to grow oats. This acreage is responsible for half of the soil loss from erosion on land growing oats. Most of the highly erodible and fragile land in oats production is in the Corn Belt, Northern Plains, Lake States, and Southern Plains. An exceptionally high 65 percent of the Corn Belt oats acreage is either highly erodible or fragile.

Barley is grown on about 8 million acres and 9 percent of that land is highly erodible or fragile--with 424,000 acres of fragile land and 281,000 acres of highly erodible land (app. table 7). Approximately 31 percent of erosion in barley comes from this 9 percent of barley acreage. Most of the highly erodible and fragile land is in the Mountain and Pacific regions.

ECONOMIC IMPACTS OF RETIRING HIGHLY ERODIBLE AND FRAGILE LAND

The greatest benefits to price support programs from retiring all highly erodible and fragile land will be realized if the surplus acres and highly erodible and fragile acres are well matched. Unfortunately, the erosion-prone crops are not always those in excess production. The lack of overlap between acres contributing to surplus production and highly erodible and fragile acres is even more noticeable for individual crops (fig. 3). About 7 million wheat acres are highly erodible and fragile, yet over three times that acreage would have to be set aside to avoid a buildup of wheat stocks. In contrast, over 22 million acres of land in row crops--corn, soybeans, sorghum, and cotton--are highly erodible. But only 12-13 million acres in these four crops would have to be idled to support their prices. The effect on prices and production of protecting highly erodible land in row crops certainly will be much greater than protecting wheat acres. The potential savings in Government deficiency and storage payments are naturally higher for crops with highly erodible acres greater than surplus acres.

Impact on Production

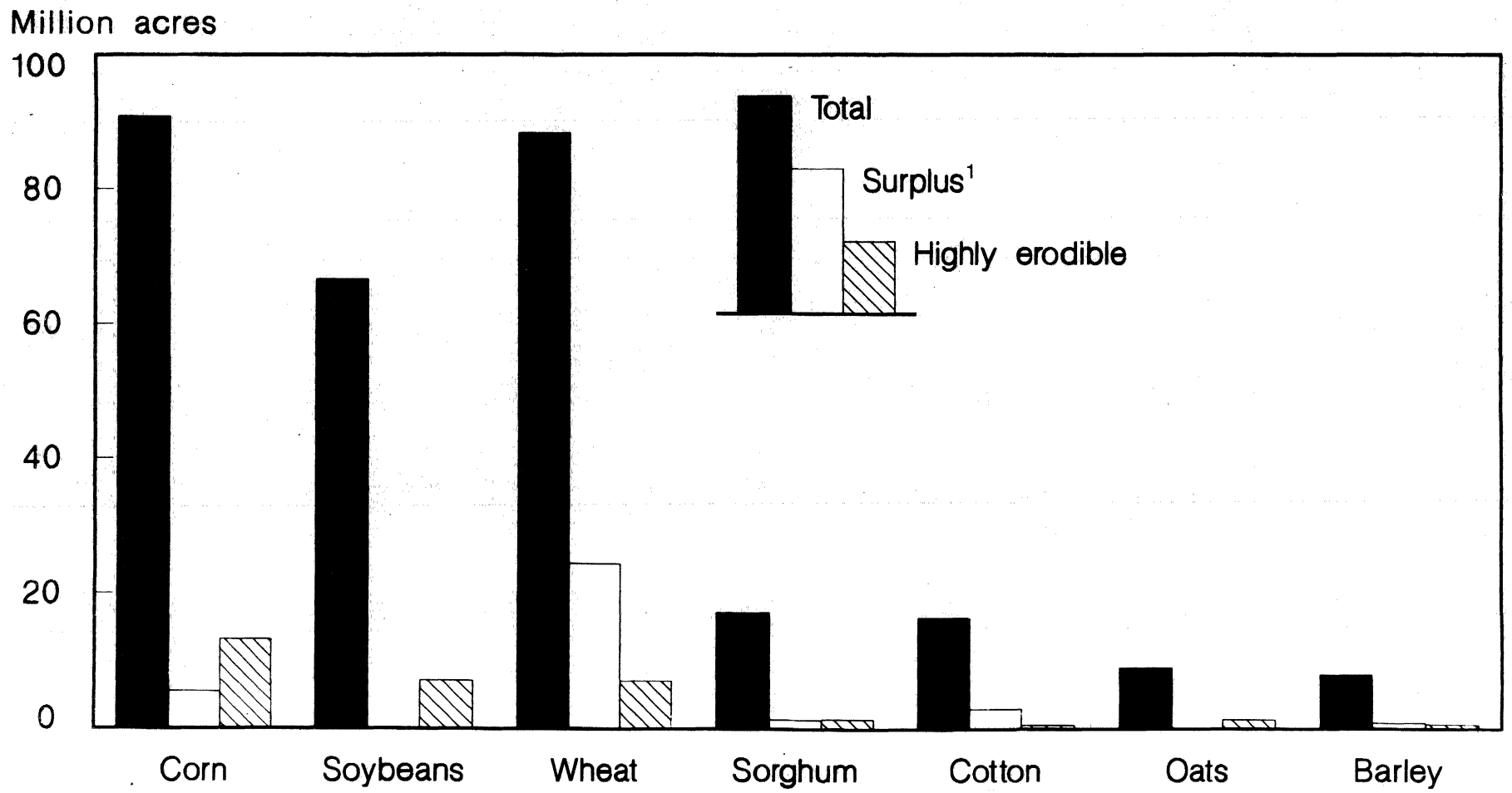
Having located highly erodible and fragile land, we can estimate the regional impact on each crop of retiring such land from production. To obtain yields for all six land groups, we modified the linear programming model developed at Iowa State University for the Resource Conservation Act Analysis (CARD-LP) to accommodate our six land groups. The documentation of the CARD-LP modeling system is presented in (2) and (6). It is a regionalized model which includes regional characteristics that influence the type and the mix of crops to be grown, the method of production and the level and mix of resource uses. It reflects the locational variation in resource uses and productivity differences for different types of lands. The model includes 105 producing areas and incorporates the six land groups noted above. Summer fallow and 10 crops are included in the model: corn, sorghum, wheat, oats, barley, soybeans, cotton, hay, nonlegume hay, and corn silage. We aggregated the information obtained from the base run solution of the model for the 10 producing regions.

We estimated the production from highly erodible and fragile land by multiplying the acres in the 1982 NRI by the corresponding land group's productivity. The production impact of retiring land into conservation uses is aggregated and presented at the regional level (table 11). Table 12 summarizes the amount of highly erodible and fragile land and the production impacts of retiring this land at the national level. The average yields on highly erodible and fragile land range from 15-30 percent lower than yields from average land. The percentage of production from this highly erodible and fragile land is, therefore, less than the corresponding acreage. Retiring all the highly erodible and fragile land has the least impact on cotton production and the greatest impact on production of oats, corn, and soybeans; those crops have a much higher proportion of land that is highly erodible and fragile.

About 7.2 million acres (8 percent) of wheat are highly erodible and fragile. They accounted for about 6 percent of U.S. wheat production in 1982. About 11 percent of soybean acreage is highly erodible and fragile land, which accounted for about 9 percent of 1982 soybean production. About 15 percent of corn acreage is highly erodible and fragile land, which accounted for about 11 percent of corn production. Cotton and sorghum both have small proportions of land in the highly erodible (water-caused erosion only) and fragile category--3 percent of cotton acreage, and 9 percent of sorghum acreage. This proportion

Figure 3

Comparison of total, surplus, and erodible acres in seven major crops



1/ Acres that would have to be idled to support prices without a buildup of stocks.

Table 11--Production from highly erodible and fragile land, by crop and by region

Region	Corn	Soybeans	Wheat	Sorghum	Oats	Cotton	Barley
				Percent			
Northeast	14.0	5.6	16.0	0	15.8	0	13.4
Appalachian	16.4	15.9	20.4	11.6	26.4	17.6	22.2
Southeast	5.4	8.1	8.8	10.1	8.0	5.5	25.0
Delta	23.8	5.7	7.4	10.5	18.3	3.0	0
Corn Belt	11.9	10.1	14.3	15.9	33.7	.1	40.6
Lake States	8.7	2.5	1.4	2.6	6.0	0	1.1
Northern Plains	9.4	10.4	3.9	5.9	7.2	0	3.3
Southern Plains	.6	.9	2.9	1.5	9.1	1.7	8.0
Mountain	1.7	0	5.1	4.7	5.0	.9	5.5
Pacific	.4	0	6.2	0	8.3	.2	9.5
U.S. average	10.8	8.9	5.9	5.3	11.6	2.3	6.1
				Million bushels 1/			
U.S. total production	9,078.1	2,033.6	2,767.1	983.5	546.9	12.2	425.1

1/ Cotton is in million bales.

Table 12--Acres and production of highly erodible and fragile land, by crop

Crop	Total cropland		Highly erodible and fragile land			
	1,000 acres	Mil. bu	1,000 acres 1/		Mil. bu 2/	
Corn	90,759	9,078.1	13,294	(14.6)	983.4	(10.8)
Soybeans	66,582	2,033.6	7,237	(10.9)	181.9	(8.9)
Wheat	88,313	2,767.1	7,216	(8.2)	163.0	(5.9)
Cotton	16,502	12,237.8	554	(3.4)	282.3	(2.3)
Sorghum	17,263	983.5	1,481	(8.6)	52.1	(5.3)
Oats	9,121	546.9	1,435	(15.7)	63.4	(11.6)
Barley	8,035	425.1	708	(8.8)	26.0	(6.1)
Total	296,575	N/A	31,925	(10.8)	NA	NA

NA = Not applicable.

1/ Numbers in parentheses show the percentage of highly erodible and fragile land producing each crop.

2/ Numbers in parentheses show the percentage of the production from the highly erodible and fragile land for each crop.

of highly erodible and fragile land in cotton and sorghum accounts for about 2 and 5 percent of cotton and sorghum production, respectively.

Impact on Farm Prices

We had to make several assumptions in estimating price impacts of a conservation reserve program. First, the farm prices, production, and Government deficiency and storage payments are projected for 1985-90 by using the Food and Agricultural Policy Simulator (FAPSIM) of ERS based on acres planted in 1984. The productivity improvement is projected to 1990 at a rate of 1.5-2 percent per year (9). Wheat, corn, sorghum, and cotton continue to be surplus crops over the projection period. The farm prices for these crops are the loan rates contained in the 1984 Agricultural Adjustment Act. This set of estimates is used as the base to evaluate the impact on prices, production, and Government deficiency and storage payments of establishing a conservation reserve.

Second, the crop production patterns are based on 1982 NRI cropland use patterns. Therefore, the impact on crop production of a conservation program depends on the distribution of highly erodible and fragile land by land group, by producing area and by crop observed in 1982 NRI.

Third, these same amounts of highly erodible and fragile land will be withdrawn from crop production for 5 years. This implies that the distribution of this highly erodible and fragile land will remain the same as the one in the 1982 NRI for 5 years. Under the conservation reserve program, this amount of highly erodible and fragile land would be subtracted from acres planted under the base scenario over the projection period for each of the seven crops.

Fourth, based on limited new plowing in recent years, there is no allowance for plowing out new land not already planted in the 1982 NRI. The total amount of cropland acres will remain the same as in the 1982 NRI.

Fifth, crop acres planted in FAPSIM depend on the net returns of each crop and those of substitutes. Therefore, we would expect acreage shifts among crops to adjust to the relative price changes due to the conservation reserve program. The total amount of acres retired remains the same over the projection period, but the final reduction in acres planted for each crop is not the same as the amount of highly erodible and fragile land identified for each crop.

For both wheat and cotton, the amount of acreage in the conservation reserve program is less than the acreage to reach the loan rate; therefore, retiring all the highly erodible and fragile wheat and cotton acres will not affect farm prices of these two crops. The prices of wheat and cotton will remain near the loan rate.

For corn, sorghum, and barley, the amount of acreage that needs to be set aside to reach loan rates is less than the acreage of highly erodible and fragile land in the conservation reserve program. The farm prices of these crops therefore, will increase if their highly erodible and fragile land is put in a long-term reserve.

Soybeans and oats are the only two of the major crops that do not now have acreage reduction programs to support their prices. These two crops also have a higher proportion of acreage on highly erodible and fragile lands. The

prices of these two crops will increase the most initially, if such a conservation reserve program is established.

In the first year or two of the program, stocks will serve as a buffer, and the crop prices, in general, will not increase as much as in the later years when stocks are lower. The shifts in acreage among crops in response to different magnitudes of price changes reduce the relative price spreads. Under the conservation reserve option, soybean prices are projected to increase by 20 percent throughout the 5 years beyond the base scenario, corn by 8-29 percent, sorghum by 2-28 percent, barley by 9-21 percent, and oats by 8-19 percent (table 13).

With this market adjustment, crop producers will shift some of the land from producing sorghum, cotton, and corn to produce more soybeans and oats. As a result, the reduction in acres planted for soybeans and oats is less than the highly erodible and fragile acreage retired from producing these two crops. In the first year, about 7 million acres of highly erodible and fragile soybean land will be retired; at the end of the projection period, the planted acreage for soybeans will have been reduced by only 4.5 million acres (table 14). Reduction in oat plantings is 400,000 acres less than the 1.9 million highly erodible and fragile acres originally retired. Meanwhile, the reduction in acres planted is projected to increase from 12.7 to 14.2 million acres for corn, 0.5 to 1.0 million acres for cotton, and 1.4 to 2.7 million acres for sorghum.

With these acreage adjustments, the percentage change in crop prices will be comparable for all seven major crops except cotton and wheat, for which surplus acres will exceed acres retired for conservation purposes. The increase in crop prices will raise cash receipts from all crops by 0.1 to 3 percent. Net farm income then will increase by about $1.6 billion the first year, but decline by $200 million to $2.3 billion per year over the rest of the projection period (table 13).

Impact on Government Deficiency Payments, Storage Payments, and Other Government Costs

In keeping with recent market-oriented proposals, we compared the conservation reserve with a program that maintains current target prices with no acreage reduction (8, 9). By idling all the highly erodible and fragile land for 5 years, the Government will realize a considerable savings in deficiency and storage payments.

Under the conservation reserve, reduced production of corn, sorghum, and barley will raise farm prices so they eventually exceed the target prices. Deficiency payments for these crops will eventually decline to zero. For wheat and cotton, on the other hand, the decline in production from highly erodible and fragile land will be insufficient to offset surplus production, so the prices of these two crops will still be below their target prices. Although deficiency payments for wheat and cotton will drop some because of the reserve, they will still be substantial. Corn has the largest amount of Government deficiency payments among the seven crops. Corn also has highly erodible acres greater than surplus acres (13.3 million vs. 5.5 million acres), therefore, corn has the most significant savings in deficiency payments. With about a 15-percent reduction of corn acreage (13.3 million acres or 11 percent of the total), the savings in deficiency payments for corn range from $1.8 billion the

Table 13--Farm price impact of retiring highly erodible and fragile land 1/

Item	1986	1987	1988	1989	1990	Target price	Loan rate
	- - - - - - - - Percent - - - - - - - -					- Dol./bu. -	
Wheat:						4.38	3.30
Change from base 2/	0	0	0	0	0		
Corn:						3.03	2.55
Change from base	8	17	15	20	29		
Sorghum:						2.88	2.42
Change from base	2	17	15	20	28		
Barley:						2.60	2.08
Change from base	9	11	10	13	21		
Oats:						--	1.31
Change from base	8	16	15	16	19		
Soybeans:						--	5.02
Change from base	24	17	21	20	22		
Cotton:						81	55
Change from base	0	0	0	0	0		
Cash receipts for total crops:	- - - - Billion dollars - - - -						
Change from base	.10	.82	1.76	2.07	3.04	NA	NA
Change in net farm income from base	1.57	-1.53	-2.26	-0.69	-0.19	NA	NA

NA = Not applicable.

-- = No current acreage reduction programs to support prices of oats and soybeans.

1/ These solutions do not represent offical U.S. Department of Agriculture forecasts, but are used only to compare alternative scenarios under specific sets of assumptions. The estimates in base scenario are based on loan rates and target prices in the 1984 Agricultural Adjustment Act with no set-aside. 1985 is used as the base year.

2/ Reflects the percentage changes of retiring highly erodible and fragile land from base scenario.

Table 14--The reduction in acres planted under a conservation reserve program

Crop	1986 1/	1987	1988	1989	1990
			1,000 acres		
Corn	12,720	14,740	13,948	14,312	14,234
Soybeans	7,012	3,016	4,680	4,131	4,515
Wheat	7,540	7,481	7,438	7,388	7,330
Cotton	458	1,098	909	1,005	965
Sorghum	1,436	2,900	2,490	2,709	2,666
Oats	1,891	1,714	1,540	1,532	1,492
Barley	785	784	772	757	685
Total	31,842	31,733	31,777	31,834	31,887

1/ There is a slight difference between the reduction in acres planted for the first year and the amount of highly erodible and fragile land. The absolute amount of acres planted in FAPSIM's base scenario is different from the 1982 NRI; the percentage of highly erodible and fragile land in 1982 NRI is used to obtain acres idled for each crop in FAPSIM.

first year to $4.8 billion in 1990 (table 15). The total savings in the deficiency payments for these five surplus crops range from $2.1 billion to $6.2 billion per year, over 5 years.

The increase in farm crop prices also causes the prices and production of livestock and dairy products to increase. Therefore, Government payments involving dairy products will also drop, ranging from $200-$500 million or 20-55 percent of Government payments on dairy products in the base scenario. However, the savings on the payments could be exaggerated if the payments to dairy and livestock are not adjusted to the increase in feed costs.

Substantial savings in storage payments can also be realized under the option of retiring all highly erodible and fragile land. Savings on storage payments are from $392 million in 1986 to $1.2 billion in 1990 (table 16).

These deficiency and storage payment savings can be compared with a $57.31 per acre per year cost of renting the 32 million conservation use acres, or $1.8 billion yearly rental costs (3). Costs of establishing and maintaining cover might raise this to $2.2 billion per year. It is important to remember, however, that the rental cost estimates are based on market rental rates and, therefore, assume erodible land can be rented by the Government in efficient size units (3). Actual costs of an option that idles all the highly erodible land would be higher than $57 per acre.

Table 15--Government deficiency payments under alternative scenarios

Item	1986	1987	1988	1989	1990
			Million dollars		
Wheat:					
Base	3,546.3	3,641.5	3,736.6	3,822.3	3,851.1
Conservation reserve	3,369.3	3,432.6	3,499.0	2,552.9	3,550.4
Difference	-177.0	-208.9	-237.6	-1,269.4	-300.7
Corn:					
Base	4,204.1	4,381.1	4,452.9	4,462.2	4,781.0
Conservation reserve	2,438.6	331.5	910.6	0	0
Difference	-1,765.5	-4,049.6	-3,542.3	-4,462.2	-4,781.0
Sorghum:					
Base	421.1	438.9	427.8	424.1	435.3
Conservation reserve	407.7	106.5	152.1	37.8	0
Difference	-16.4	-332.4	-275.7	-386.3	-435.3
Barley:					
Base	146.3	125.4	113.4	100.7	103.9
Conservation reserve	42.3	0	0	0	0
Difference	-104.0	-125.4	-113.4	-100.7	-103.9
Cotton:					
Base	1,607.9	2,006.7	2,007.8	2,008.4	2,007.2
Conservation reserve	1,607.4	2,001.7	2,004.9	2,004.2	2,002.9
Difference	- 0.5	- 5.0	- 2.9	- 4.2	- 4.3
Total:					
Base	9,928.7	10,593.6	10,738.5	10,817.7	11,178.5
Conservation reserve	7,865.3	5,872.3	6,566.6	4,594.9	5,553.3
Difference from base	-2,063.4	-4,721.3	-4,171.9	-6,222.8	-5,625.2
			Percent		
Change from base	-26.2	-44.6	-38.8	-57.5	-50.3

Table 16--Government storage payments under alternative scenarios

Item	1986	1987	1988	1989	1990
			Million dollars		
Wheat:					
Base	553.9	606.9	813.6	900.0	900.0
Conservation reserve	504.8	499.0	650.0	715.0	724.7
Difference	-49.1	-107.9	-163.6	-185.8	-175.3
Corn:					
Base	666.2	827.3	900.0	900.0	856.6
Conservation reserve	365.1	276.8	283.8	239.2	0
Difference	-301.1	-550.5	-616.2	-660.8	-856.6
Sorghum:					
Base	107.0	94.0	119.7	123.9	126.8
Conservation reserve	74.8	37.0	41.5	27.3	11.5
Difference	-32.2	-57.0	-78.2	-96.6	-115.3
Barley:					
Base	52.2	32.9	38.9	37.8	31.1
Conservation reserve	47.1	16.0	11.9	0	0
Difference	-5.1	-16.9	-27.0	-37.8	-31.1
Oats:					
Base	4.2	2.4	0	0	0
Conservation reserve	0	0	0	0	0
Difference	-4.2	-2.4	0	0	0
Total:					
Base	1,383.5	1,563.5	1,872.2	1,961.7	1,914.5
Conservation reserve	991.8	828.8	987.2	981.5	736.2
Difference	-391.7	-734.7	-885.0	-980.2	-1,178.3
			Percent		
Change from the base	-28.3	-47.0	-47.3	-50.0	-61.5

SOIL SAVINGS

The soil savings from establishing a conservation reserve will be substantial. As mentioned earlier, the erosion rate is determined by the product of two sets of factors: (1) physical factors of RKLS and (2) managerial factors including conservation practices (C) and cropping practices (P). The average value of CP for land used in crop production is 0.3. If highly erodible land is put on long-term reserve and a permanent cover established, then the value of CP will be reduced to one-tenth of present levels (or about 0.03). The erosion rate for these acres in the long-term reserve will be just one-tenth of the erosion rate when the land is used for growing crops. Of the 32 million acres total, 16.1 million acres are in land group 4 (LCC IIe and IIIe, RKLS > 50) with an average erosion rate of 21.8 TAY (table 17), 6.3 million acres are in land group 5 (LCC IVe, RKLS > 50) with an average erosion rate of 27.7 TAY, and 9.6 million acres are fragile land (group 6) with an average erosion rate of 14.4 TAY. The soil savings from retiring these 31.9 million acres will amount to 597 million tons per year.

There are also about another 12 million acres of hayland whose RKLS values are so high that, if converted to other crops, they would have potential erosion greater than 15 TAY. As long as these 12 million acres remain in hay production, the average erosion rate on most of this potentially erosive land can be managed below the tolerable rate, generally assumed to be 5 TAY. There are some highly erodible areas in summer fallow and other minor crops in land groups 4, 5, and 6, but the amount is fairly small.

Erosion damage to soil productivity generally occurs on soils eroding above the 5 TAY tolerance level. Highly erodible and fragile land accounts for about three-fourths of this damaging erosion, which suggests that erosion-related problems could be substantially reduced if the erosion-prone land were taken out of production.

Table 17--Soil savings from establishing a conservation reserve

Crop	Highly erodible and fragile land								Soil savings 1/			
	Area				Erosion rate							
	LG4	LG5	LG6	Total	LG4	LG5	LG6	Average	LG4	LG5	LG6	Total
	1,000 acres				Tons/acre				Million tons			
Corn	7,923	2,943	2,429	13,295	21.1	29.1	21.9	23.0	150.4	77.1	47.9	275.4
Soybeans	4,582	1,366	1,287	7,235	26.1	35.9	29.6	28.6	107.7	44.1	34.3	186.1
Wheat	2,114	1,186	3,916	7,216	17.6	20.0	7.8	12.7	33.5	21.3	27.5	82.3
Sorghum	505	300	675	1,480	19.7	21.2	10.6	15.9	9.0	5.7	6.4	21.1
Cotton	135	35	384	554	31.4	42.4	5.4	14.1	3.8	1.3	1.9	7.0
Oats	654	345	436	1,435	12.6	17.7	10.3	13.1	9.4	5.6	2.0	17.0
Barley	149	135	424	708	16.0	18.1	5.0	9.6	1.7	2.2	3.9	7.8
Total or acreage	16,062	6,310	9,551	1,3923	21.8	27.7	14.4	20.5	315.5	157.3	123.9	596.7

1/ Erosion rate is determined by the physical factors of RKLS and managerial factors of CP. Once put on long-term reserve and a permanent cover such as pasture, trees, or other treatment established, the value of CP for the land is estimated to drop to one-tenth of the value of CP when used for growing crops. Therefore, the soil savings per acre of land in long-term reserve are nine-tenths of the original erosion rate.

REFERENCES

(1) Bills, Nelson L., and Ralph Heimlich. Assessing Erosion on U.S. Cropland, AER-513. Economic Research Service, U.S. Department of Agriculture. July 1984.

(2) English, Burt, Klaus Alt, and Earl Heady. A Documentation of the Resources Conservation Act's Assessment Model of Regional Agricultural Production, Land and Water Use, and Soil Loss. The Center for Agricultural and Rural Development, Iowa State University, CARD Report 107T. Ames, Iowa, 1982.

(3) Grano, Anthony, and others. Analysis of Policies to Conserve Soil and Reduce Surplus Crop Production, AER-534. Economic Research Service, U.S. Department of Agriculture. April 1985.

(4) Heimlich, Ralph E., and Nelson L. Bills. "An Improved Soil Erosion Classification for Conservation Policy," Journal of Soil and Water Conservation. 1984, Vol. 39, No. 4: pp. 261-266.

(5) Hoag, Dana L., and Douglas L. Young. "Will USDA's Conservation Reserve Program Make Erodible Land Retirement Profitable?" Paper presented to Western Agricultural Economics Association Annual Meetings, San Diego, CA, July 8-10, 1984.

(6) Huang, Wen-Yuan, Burton C. English, Shwu-Eng Webb, and Clayton Ogg. "A National Linear Programming Model and Data Base for Analysis of Soil Erosion," Economic Research Service, U.S. Department of Agriculture. Forthcoming.

(7) Ogg, Clayton, Shwu-Eng Webb, and Wen-Yuan Huang. "Economic Analysis of Acreage Reduction Alternatives Including a Soil Conservation Reserve and Competitive Bids," Journal of Soil and Water Conservation. Nov.-Dec., 1984, Vol. 39, No. 6, pp. 379-383.

(8) Reichelderfer, Katherine H. Do USDA Farm Program Participants Contribute to Soil Erosion? AER-532. Economic Research Service, U.S. Department of Agriculture. April 1985.

(9) U.S. Department of Agriculture, Economic Research Service. Agricultural Outlook, AO-109, June 1985.

(10) _____, Statistical Reporting Service. Agricultural Statistics, 1983.

(11) _____. National Resource Inventory computer tapes, 1978.

(12) _____. National Resource Inventory computer tapes, 1984.

(13) Wischemeier, W. H., and D. D. Smith. Predicting Rainfall Erosion Losses-A Guide to Conservation Planning, AH-537. U.S. Department of Agriculture, Science and Education Administration. December 1978.

Appendix table 1--Corn cropland, highly erodible land, and fragile land, by region

Region	Total corn	Highly erodible and fragile lands				Percentage of region's corn cropland
		LG4	LG5	LG6	Total	
	1,000 acres					Percent
Northeast	5,383	774	243	215	1,232	22.9
Appalachian	5,712	805	277	223	1,305	22.8
Southeast	3,271	111	66	83	260	8.0
Delta States	290	44	15	24	82	28.3
Corn Belt	41,870	4,584	1,319	740	6,644	15.9
Lake States	16,327	929	440	399	1,768	10.8
Northern Plains	14,240	669	583	659	1,911	13.4
Southern Plains	1,389	5	0	10	15	1.1
Mountain	1,581	1	0	68	69	4.3
Pacific	696	0	0	9	9	1.3
U.S. total	90,759	7,922	2,943	2,430	13,295	14.6

Source: (11).

Appendix table 2--Soybeans cropland, highly erodible land, and fragile land, by region

Region	Total soybeans	Highly erodible and fragile lands				Percentage of region's soybean cropland
		LG4	LG5	LG6	Total	
	1,000 acres					Percent
Northeast	976	37	9	20	66	6.9
Appalachian	6,614	745	275	318	1,337	20.2
Southeast	6,117	315	119	132	566	9.3
Delta States	12,205	461	126	410	996	8.2
Corn Belt	29,663	2,527	647	304	3,480	11.7
Lake States	6,063	98	31	32	161	2.7
Northern Plains	4,126	398	160	57	615	14.9
Southern Plains	811	1	0	13	14	1.7
Mountain	1	0	0	0	0	0
Pacific	7	0	0	0	0	0
U.S. total	66,583	4,582	1,367	1,286	7,235	10.9

Source: (11).

Appendix table 3--Wheat cropland,
highly erodible land, and fragile land, by region

Region	Total wheat	Highly erodible and fragile lands				Percentage of region's wheat cropland
		LG4	LG5	LG6	Total	
	1,000 acres					Percent
Northeast	647	82	27	23	132	20.4
Appalachian	1,866	320	94	75	489	26.2
Southeast	1,309	92	13	28	133	10.1
Delta States	1,104	55	14	25	95	8.6
Corn Belt	7,981	886	324	240	1,450	18.2
Lake States	4,745	22	20	45	88	1.8
Northern Plains	33,582	342	235	1,344	1,919	5.7
Southern Plains	17,322	72	102	648	822	4.7
Mountain	14,269	64	101	1,235	1,400	9.8
Pacific	5,488	179	256	255	690	12.6
U.S. total	88,313	2,114	1,186	3,918	7,218	8.2

Source: (11).

Appendix table 4--Sorghum cropland,
highly erodible land, and fragile land, by region

Region	Total Sorghum	Highly erodible and fragile lands				Percentage of region's sorghum cropland
		LG4	LG5	LG6	Total	
	1,000 acres					Percent
Northeast	22	0	0	0	0	0
Appalachian	225	21	12	12	45	19.6
Southeast	336	29	18	6	53	15.9
Delta States	452	25	7	24	56	12.4
Corn Belt	1,167	138	44	33	215	18.4
Lake States	68	2	0	2	4	5.1
Northern Plains	7,314	276	203	262	741	10.1
Southern Plains	6,580	13	16	202	231	3.5
Mountain	1,077	0	0	135	135	12.6
Pacific	22	0	0	0	0	0
U.S. total	17,263	504	300	676	1,480	8.6

Source: (11).

Appendix table 5--Cotton cropland, highly erodible land, and fragile land, by region

Region	Total cotton	Highly erodible and fragile lands				Percentage of region's cotton cropland
		LG4	LG5	LG6	Total	
	1,000 acres					Percent
Northeast	2	0	0	0	0	0
Appalachian	367	44	17	11	72	19.6
Southeast	767	23	6	11	40	5.2
Delta States	2,662	57	12	21	90	3.4
Corn Belt	315	0	0	0	0	0
Lake States	0	0	0	0	0	0
Northern Plains	3	0	0	0	0	0
Southern Plains	10,198	12	0	328	340	3.3
Mountain	590	0	0	8	8	1.4
Pacific	1,599	0	0	4	4	.3
U.S. total	16,502	136	35	383	554	3.4

Source: (11).

Appendix table 6--Oats cropland, highly erosive land, and fragile land, by region

Region	Total oats	Highly erodible and fragile lands				Percentage of region's oats cropland
		LG4	LG5	LG6	Total	
	1,000 acres					Percent
Northeast	563	72	19	20	111	19.7
Appalachian	65	11	6	2	19	29.8
Southeast	81	4	0	4	8	9.9
Delta States	39	6	1	0	7	19.8
Corn Belt	1,075	307	124	48	479	44.6
Lake States	2,214	137	74	62	273	12.3
Northern Plains	3,318	84	94	187	365	11.0
Southern Plains	1,230	27	26	71	124	10.1
Mountain	316	0	0	24	24	7.5
Pacific	220	7	0	18	25	11.4
U.S. total	9,121	655	344	436	1,435	15.7

Source: (11).

Appendix table 7--Barley cropland, highly erodible land, and fragile land, by region

Region	Total barley	Highly erodible and fragile lands				Percentage of region's barley cropland
		LG4	LG5	LG6	Total	
	1,000 acres					Percent
Northeast	111	12	2	1	15	13.1
Appalachian	112	17	5	3	25	22.5
Southeast	16	4	0	0	4	24.5
Delta States	3	0	0	0	0	0
Corn Belt	19	7	1	1	9	41.4
Lake States	812	1	0	8	9	1.2
Northern Plains	2,182	2	1	86	89	4.1
Southern Plains	133	0	0	16	16	11.9
Mountain	2,892	35	26	202	263	9.1
Pacific	1,755	72	100	107	279	15.9
U.S. total	8,035	150	135	424	709	8.8

Source: (11).

Appendix table 8--Seven major crops: Cropland, highly erodible land, and fragile land, by region

Region	Total acres 1/	Highly erodible and fragile lands				Percentage of region's cotton cropland
		LG4	LG5	LG6	Total	
	1,000 acres					Percent
Northeast	7,704	977	300	279	1,556	20.2
Appalachian	14,961	1,963	686	644	3,293	22.0
Southeast	11,897	578	222	264	1,064	9.0
Delta States	16,755	648	175	504	1,327	7.9
Corn Belt	82,090	8,449	2,459	1,366	12,274	15.0
Lake States	30,229	1,189	565	548	2,302	7.6
Northern Plains	64,765	1,771	1,276	2,595	5,643	8.7
Southern Plains	37,663	130	144	1,288	1,562	4.1
Mountain	20,726	100	127	1,672	1,899	9.2
Pacific	9,787	258	356	393	1,007	10.3
U.S. total	296,577	16,063	6,310	9,553	31,926	10.8

1/ Total acres include acreage for corn, soybeans, wheat, sorghum, cotton, oats, barley.

Source: (11).

☆U.S. GOVERNMENT PRINTING OFFICE: 1986-490-920-40069

Readings On

Soil Conservation and Farmland

Assessing Erosion on U.S. Cropland: Land Management and Physical Features, by Nelson L. Bills and Ralph E. Heimlich. AER-513. July 1984. 24 pp. $1.50. Order SN: 001-019-00341-3 from GPO.

Erosion from rainfall causes nearly 100 million acres of U.S. cropland to erode by more than 5 tons per acre per year. One-third of this land is so highly erosive that annual soil loss can be reduced to tolerable levels only under the most restrictive land management practices. More than one-third of U.S. cropland is inherently nonerosive under all management regimes, about half requires conservation management to keep soil loss within tolerable limits, and the remaining 8 percent is so erosive that acceptable soil loss rates cannot be achieved under intensive cultivation.

Do USDA Farm Program Participants Contribute to Soil Erosion? by Katherine H. Reichelderfer. AER-532. April 1985. 84 pp. $3.00. Order SN: 001-019-00383-9 from GPO.

Finds that only about one-third of U.S. cropland with excessive soil erosion rates is operated by farmers who might be influenced to reduce erosion if changes were made in USDA's commodity and soil conservation programs. Present commodity programs may conflict with conservation programs by encouraging cultivation of erosive crops. Efforts to increase the consistency of USDA commodity and conservation programs would contribute little to overcoming the Nation's total erosion problem.

Cropland Rental and Soil Conservation in the United States, by Nelson L. Bills. AER-529. March 1985. 20 pp. $1.50. Order SN: 001-019-00387-1 from GPO.

Data from USDA's Resource Economics Survey challenge the common but not well-substantiated view that farmers are less concerned with erosion on land they rent than on land they own. At the national level, farmers' conservation efforts on rented cropland compare favorably with those on owner-operated cropland.

Major Uses of Land in the United States: 1982, by H. Thomas Frey and Roger W. Hexem. AER-535. June 1985. 36 pp. $1.25. Order SN: 001-019-00398-7 from GPO.

Discusses the major uses of the Nation's 2,265 million acres of land in 1982: cropland, 469 million acres; grassland pasture and range, 597 million acres; forest land (exclusive of areas in special-purpose uses), 655 million acres; special uses, 270 million acres; and miscellaneous other land, 274 million acres. Changes in cropland and pasture acreages were barely perceptible during 1978-82; forest land (except special use areas) and miscellaneous other land decreased sharply as large acreages in these categories were reclassified as parks, wilderness, and related uses.

Agriculture's Links With U.S. and World Economies, by Alden C. Manchester. AIB-496. September 1985. 60 pp. $1.50. Order SN: 001-019-00409-6 from GPO.

Describes the linkages between farming and the supplying industries and those manufacturing and distributing farm products. Within the last 30 years, the food and fiber system has found itself increasingly reliant on nonfarm industries and increasingly affected by general economic developments, not only within the Nation but from overseas as well.

Improving U.S. Farmland, by Douglas Lewis and Thomas A. McDonald. AIB-482. November 1984. 12 pp. $1.00. Order SN: 001-019-00362-6 from GPO.

A clear, concise account of recent farmland improvements. Farmers invested more than $6.5 billion in improving their land in a recent 3-year period. Those investments, while often made on existing cropland, expanded total U.S. cropland by 9.1 million acres.

TO ORDER, WRITE TO:

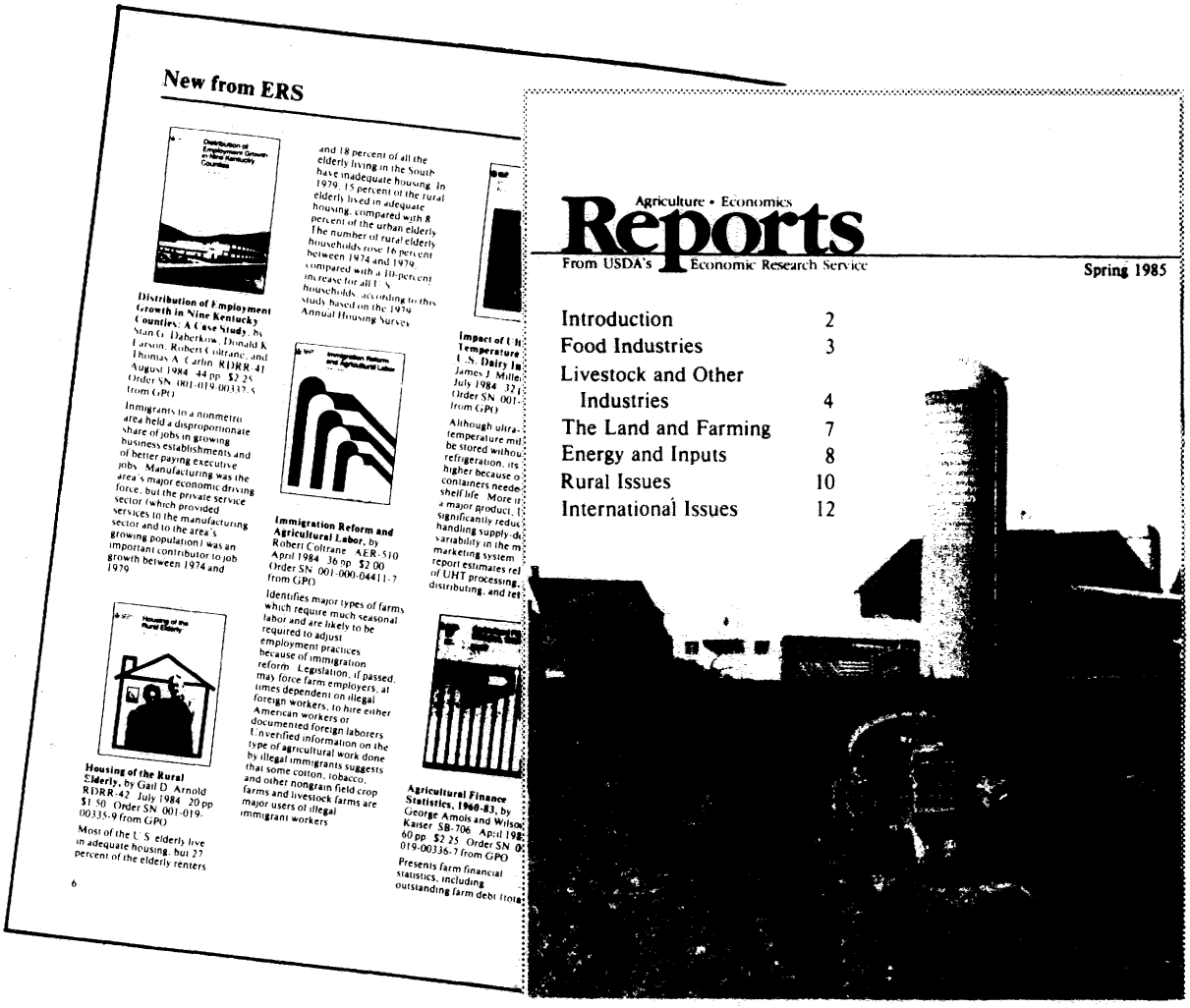
Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402.

Telephone (202) 783-3238.

Make check payable to Superintendent of Documents and be sure to include the stock number of each publication ordered.

Bulk discount of 25% for 100 or more copies sent to one address. For foreign orders, please add 25% for postage.

Stay ahead with the latest market information--



Subscribe now to **Reports**

Reports catalogue brings you, several times a year, descriptive listings of new publications from ERS. To get on our free mailing list, send your name and address to: **Reports, EMS Information, USDA, 1301 New York Avenue, N. W., Rm. 237, Washington, D. C. 20005-4788**

UNITED STATES DEPARTMENT OF AGRICULTURE
ECONOMIC RESEARCH SERVICE
1301 NEW YORK AVENUE, N. W.
WASHINGTON, D. C. 20005-4788